

SEQUENCE LISTING

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Van Houdt, Sara

<120> Novel Bacillus thuringiensis insecticidal proteins

<130> 58764.000036

<150> US 09/756,296

<151> 2001-01-09

<160> 9

<170> PatentIn version 3.0

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<212> DNA

<213> Bacillus thuringiensis

<220>

<221> CDS

<222> (1)..(1896)

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Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala Arg	
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gct gtg ttt aat caa aat ttt agt tgt agc aca ttt ctc cca cct ttg Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu 355 360 365	1104
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Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val Val	
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Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn Leu	
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Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val Thr Ile	
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Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn Asn	
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gat gga gtt aat gat aat ggc gct cgt ttt tta gat att aat atg ggt	1776
Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Leu Asp Ile Asn Met Gly	
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595 600 605	
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Tyr Val Ala Pro Ile Val Gly Thr Val Ser Ser Phe Leu Leu Lys Lys	
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Val Gly Ser Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly Leu	
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Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg Glu	
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Val Asn Ala Glu Leu Glu Gly Leu Gln Ala Asn Ile Arg Glu Phe Asn	
115 120 125	
Gln Gln Val Asp Asn Phe Leu Asn Pro Thr Gln Asn Pro Val Pro Leu	
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Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val Val	
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 195 200 205

Gln Asn Tyr Leu Lys Asn Tyr Thr Thr Glu Tyr Ser Asn Tyr Cys Ile
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Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn Ser
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Pro Asn Ile Gly Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu Leu
 325 330 335

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Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu
 355 360 365

Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg Gly
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Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val Val
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Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile Arg Asn
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Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr Met Val
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Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn Gly
 465 470 475 480

Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile Ser
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Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser
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Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser Asn
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Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn Asn
 565 570 575

Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Leu Asp Ile Asn Met Gly
 580 585 590

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Asn Val Val Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu Asp	
20 25 30	
acc ata caa gaa gaa tgg atg gag tgg aaa aaa gat aat cat agt tta	144
Thr Ile Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser Leu	
35 40 45	
tat gta gat cct att gtt gga act gtg gct agt ttt ctt tta aag aaa	192
Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys Lys	
50 55 60	
gtg ggg agt ctt gtt gga aaa aga ata ctg agt gag tta cgg aat tta	240
Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn Leu	
65 70 75 80	
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Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg Glu	
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Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala Arg	
100 105 110	
gta aat gcg gaa ttg aca ggg ctg caa gca aat gta gaa gag ttt aat	384
Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe Asn	
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Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro Leu	
130 135 140	
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145 150 155 160	
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Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr Tyr	
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Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser Gly	
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275 280 285	
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Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn Ser	
290 295 300	
aat tat gtg tta aat ggc ttt agt ggc gct aga ctt acg cag act ttc	960
Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln Thr Phe	
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cct aat att gtt ggt tta cct ggt act act aca act cac gca ttg ctt	1008
Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr His Ala Leu Leu	
325 330 335	
gct gca agg gtc aat tac agt gga gga gtt tgc tct ggt gat ata ggc	1056
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340 345 350	
gct gtg ttt aat caa aat ttt agt tgt agc aca ttt ctc cca cct ttg	1104
Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu	
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Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val Val	
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435 440 445	
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Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile Ser
485 490 495

ccg ata cat gca act caa gtg aat aat caa acg cga aca ttt att tct 1536
Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser
500 505 510

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Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser Asn
515 520 525

acg aca gct cgt tat aca ctt aga ggg aat gga aat agt tac aat ctt 1632
Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn Leu
530 535 540

tat tta aga gta tct tca ata gga aat tcc act att cga gtt act ata 1680
Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val Thr Ile
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aac ggt aga gtt tat act gct tca aat gtt aat act act aca aat aac 1728
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565 570 575

gat gga gtt aat gat aat gga gct cgt ttt tca gat att aat att ggt 1776
Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile Gly
580 585 590

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595 600 605

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35 40 45

Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys Lys

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Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala Arg
100 105 110

Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe Asn
115 120 125

Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro Leu
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Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn Arg
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Leu Thr Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro Leu
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Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val Ile
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195 200 205

Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys Ile
210 215 220

Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His Asp
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Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr Val
245 250 255

Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser Gly
260 265 270

Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser Phe
275 280 285

Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn Ser

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295

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Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln Thr Phe
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Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu Leu
325 330 335

Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile Gly
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Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu
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Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg Gly
370 375 380

Gly Ile Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu Thr Thr
385 390 395 400

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Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn Gly
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Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile Ser
485 490 495

Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser
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Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser Asn
515 520 525

Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn Leu
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Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val Thr Ile
545 550 555 560

Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn Asn
565 570 575

Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile Gly
580 585 590

Asn Val Val Ala Ser Asp Asn Thr Asn Val Pro Leu Asp Ile Asn Val
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Asn Val Val Ala His Asp Pro Phe Ser Phe Glu His Lys Ser Leu Asp
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acc ata caa aaa gaa tgg atg gag tgg aaa aga act gat cat agt tta 144
Thr Ile Gln Lys Glu Trp Met Glu Trp Lys Arg Thr Asp His Ser Leu
35 40 45

tat gta tct cct att gta gga act ata gcc agt ttt ctg tta aag aaa 192
Tyr Val Ser Pro Ile Val Gly Thr Ile Ala Ser Phe Leu Leu Lys Lys
50 55 60

ata gga ggg ctt ata gga aaa aga ata tta agt gag tta aag aat tta 240
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Ile Phe Pro Ser Gly Ser Ile Glu Ser Met Gln Asp Ile Leu Arg Gly
85 90 95

gca gaa caa ttt cta aat caa aga ctt gat gca gac acc ttt agt cgt Ala Glu Gln Phe Leu Asn Gln Arg Leu Asp Ala Asp Thr Phe Ser Arg 100 105 110	336
gta gaa gca gaa ttg aga ggg ctt caa gca aat gta gag gaa ttt aat Val Glu Ala Glu Leu Arg Gly Leu Gln Ala Asn Val Glu Glu Phe Asn 115 120 125	384
cga caa gtg gac aat ttt tta aac cca aat caa aac cct gcc cct tta Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Gln Asn Pro Ala Pro Leu 130 135 140	432
gca ata att gat tcg gtt aat aca ttg caa caa tta ttc cta agt aga Ala Ile Ile Asp Ser Val Asn Thr Leu Gln Gln Leu Phe Leu Ser Arg 145 150 155 160	480
tta ccc cag ttc cag ata caa cgc tat cag cta tta tta tta cct tta Leu Pro Gln Phe Gln Ile Gln Arg Tyr Gln Leu Leu Leu Leu Pro Leu 165 170 175	528
ttt gca caa gca gcc aat tta cac ctt tct ttt att aga gac gtt att Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val Ile 180 185 190	576
ctt aat gca gat gaa tgg gga ata cca gct gca acg gtg cgc aca tat Leu Asn Ala Asp Glu Trp Gly Ile Pro Ala Ala Thr Val Arg Thr Tyr 195 200 205	624
aga gag cac cta caa aga tat aca cgc gaa tac tcc aat tat tgt ata Arg Glu His Leu Gln Arg Tyr Thr Arg Glu Tyr Ser Asn Tyr Cys Ile 210 215 220	672
aat acg tat caa act gcg ttt aga ggg tta aat gcc act tta cac gat Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Ala Thr Leu His Asp 225 230 235 240	720
ttt cta gaa ttt aga aca tat atg ttt tta aat gta tta gac tat gta Phe Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Leu Asp Tyr Val 245 250 255	768
tct atc tgg tcg ttg ttt aaa tat cag agc ctt ctg gta tcc tct ggc Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser Gly 260 265 270	816
gct aat tta tat gcg agt ggt agt gga gta aca aat aga caa tca ttt Ala Asn Leu Tyr Ala Ser Gly Ser Gly Val Thr Asn Arg Gln Ser Phe 275 280 285	864
act gca caa gac tgg cca ttt tta aat tct ctt ttc caa gtt aat caa Thr Ala Gln Asp Trp Pro Phe Leu Asn Ser Leu Phe Gln Val Asn Gln 290 295 300	912
aat tat gta tta aca ggt atg aat ggt tat agg tat act tta agt tct Asn Tyr Val Leu Thr Gly Met Asn Gly Tyr Arg Tyr Thr Leu Ser Ser 305 310 315 320	960
gtt ttt ggt aca aat caa aca ata cat tct gtt agg agt aat tat agg Val Phe Gly Thr Asn Gln Thr Ile His Ser Val Arg Ser Asn Tyr Arg 325 330 335	1008
ggc ggg gtt tca tct ggt tac att gga gtt aat ctt agt gaa ggt gac	1056

Gly Gly Val Ser Ser Gly Tyr Ile Gly Val Asn Leu Ser Glu Gly Asp	
340 345 350	
caa aat ttt agt tgt agt aca ttt ttg gat cct tta gaa aca ccg ttt	1104
Gln Asn Phe Ser Cys Ser Thr Phe Leu Asp Pro Leu Glu Thr Pro Phe	
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att aga agt tgg ctg gat tca ggt agc gat gat ggc ttt aat tgg agt	1152
Ile Arg Ser Trp Leu Asp Ser Gly Ser Asp Asp Gly Phe Asn Trp Ser	
370 375 380	
aca gga gtc ttt aca aca act att ggt tta cct act tgt agc att ttt	1200
Thr Gly Val Phe Thr Thr Thr Ile Gly Leu Pro Thr Cys Ser Ile Phe	
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tgg cct cgt ggt aac tcg aac tat ttt cca gat tat ttt ata cga aat	1248
Trp Pro Arg Gly Asn Ser Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn	
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att tct ggt gtc gtt ggt cgt ctt agg aac gaa gat tta aga aga cca	1296
Ile Ser Gly Val Val Gly Arg Leu Arg Asn Glu Asp Leu Arg Arg Pro	
420 425 430	
cta tat ttt aat gag ata aga aat ata gta gga aat aac aat cca ccg	1344
Leu Tyr Phe Asn Glu Ile Arg Asn Ile Val Gly Asn Asn Asn Pro Pro	
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gca act gga tcg tta tca gtc gcc agc cta gtc tct gtg cat aac aga	1392
Ala Thr Gly Ser Leu Ser Val Ala Ser Leu Val Ser Val His Asn Arg	
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aaa aat aat att tat gct gct cat gaa aat ggt act atg att cat ttg	1440
Lys Asn Asn Ile Tyr Ala Ala His Glu Asn Gly Thr Met Ile His Leu	
465 470 475 480	
gca ccg gaa gat tat aca ggt ttc aca atg tca cca ata cat gca act	1488
Ala Pro Glu Asp Tyr Thr Gly Phe Thr Met Ser Pro Ile His Ala Thr	
485 490 495	
caa gta aat aat caa aca cga aca ttt att tcc gag aaa tta gga aac	1536
Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser Glu Lys Leu Gly Asn	
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caa ggt gat tcc ttg aga ttt gaa caa aca aat aca acg gct cga tac	1584
Gln Gly Asp Ser Leu Arg Phe Glu Gln Thr Asn Thr Thr Ala Arg Tyr	
515 520 525	
aca ttt aga ggg aat gga aat agt tac aat ctt tat tta aga gta tct	1632
Thr Phe Arg Gly Asn Gly Asn Ser Tyr Asn Leu Tyr Leu Arg Val Ser	
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tca cta gga aat tcc aca att cga gtt act ata aac ggt aga gtt tat	1680
Ser Leu Gly Asn Ser Thr Ile Arg Val Thr Ile Asn Gly Arg Val Tyr	
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Thr Val Ser Asn Val Asn Thr Thr Thr Asn Asn Asp Gly Val Val Asp	
565 570 575	
aat ggc gct cgt ttt tca gat att aat ata ggt aat gta gtg gca agt	1776
Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile Gly Asn Val Val Ala Ser	

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Ala Asn Thr Asn Ile Pro Leu Asp	Ile Asn Val Thr Phe Asn Ser Gly		
595	600	605	
acg caa ttt gag ctt atg aat att atg ttt gtt cca act aat att cca			1872
Thr Gln Phe Glu Leu Met Asn Ile Met Phe Val Pro Thr Asn Ile Pro			
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Pro Ile Tyr			
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35	45

Tyr Val Ser Pro Ile Val Gly Thr Ile Ala Ser Phe Leu Leu Lys Lys	
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Ile Gly Gly Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Lys Asn Leu	
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Ile Phe Pro Ser Gly Ser Ile Glu Ser Met Gln Asp Ile Leu Arg Gly	
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Ala Glu Gln Phe Leu Asn Gln Arg Leu Asp Ala Asp Thr Phe Ser Arg	
100	110

Val Glu Ala Glu Leu Arg Gly Leu Gln Ala Asn Val Glu Glu Phe Asn	
115	125

Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Gln Asn Pro Ala Pro Leu	
130	140

Ala Ile Ile Asp Ser Val Asn Thr Leu Gln Gln Leu Phe Leu Ser Arg	
145	160

Leu Pro Gln Phe Gln Ile Gln Arg Tyr Gln Leu Leu Leu Leu Pro Leu
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Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val Ile
180 185 190

Leu Asn Ala Asp Glu Trp Gly Ile Pro Ala Ala Thr Val Arg Thr Tyr
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Arg Glu His Leu Gln Arg Tyr Thr Arg Glu Tyr Ser Asn Tyr Cys Ile
210 215 220

Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Ala Thr Leu His Asp
225 230 235 240

Phe Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Leu Asp Tyr Val
245 250 255

Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser Gly
260 265 270

Ala Asn Leu Tyr Ala Ser Gly Ser Gly Val Thr Asn Arg Gln Ser Phe
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Thr Ala Gln Asp Trp Pro Phe Leu Asn Ser Leu Phe Gln Val Asn Gln
290 295 300

Asn Tyr Val Leu Thr Gly Met Asn Gly Tyr Arg Tyr Thr Leu Ser Ser
305 310 315 320

Val Phe Gly Thr Asn Gln Thr Ile His Ser Val Arg Ser Asn Tyr Arg
325 330 335

Gly Gly Val Ser Ser Gly Tyr Ile Gly Val Asn Leu Ser Glu Gly Asp
340 345 350

Gln Asn Phe Ser Cys Ser Thr Phe Leu Asp Pro Leu Glu Thr Pro Phe
355 360 365

Ile Arg Ser Trp Leu Asp Ser Gly Ser Asp Asp Gly Phe Asn Trp Ser
370 375 380

Thr Gly Val Phe Thr Thr Thr Ile Gly Leu Pro Thr Cys Ser Ile Phe
385 390 395 400

Trp Pro Arg Gly Asn Ser Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn
405 410 415

Ile Ser Gly Val Val Gly Arg Leu Arg Asn Glu Asp Leu Arg Arg Pro
420 425 430

Leu Tyr Phe Asn Glu Ile Arg Asn Ile Val Gly Asn Asn Asn Pro Pro
435 440 445

Ala Thr Gly Ser Leu Ser Val Ala Ser Leu Val Ser Val His Asn Arg
450 455 460

Lys Asn Asn Ile Tyr Ala Ala His Glu Asn Gly Thr Met Ile His Leu
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Ala Pro Glu Asp Tyr Thr Gly Phe Thr Met Ser Pro Ile His Ala Thr
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Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser Glu Lys Leu Gly Asn
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Gln Gly Asp Ser Leu Arg Phe Glu Gln Thr Asn Thr Thr Ala Arg Tyr
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Ser Leu Gly Asn Ser Thr Ile Arg Val Thr Ile Asn Gly Arg Val Tyr
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Thr Val Ser Asn Val Asn Thr Thr Thr Asn Asn Asp Gly Val Val Asp
565 570 575

Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile Gly Asn Val Val Ala Ser
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Ala Asn Thr Asn Ile Pro Leu Asp Ile Asn Val Thr Phe Asn Ser Gly
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Pro Ile Tyr
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Ala Tyr Asn Val Val Ala His Asp Pro Phe Ser Phe Glu His Lys Ser
          20             25             30

ctt gat aca att agg aag gag tgg atg gag tgg aag agg act gat cat      143
Leu Asp Thr Ile Arg Lys Glu Trp Met Glu Trp Lys Arg Thr Asp His
          35             40             45

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Ser Leu Tyr Val Ala Pro Ile Val Gly Thr Val Ser Ser Phe Leu Leu
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aag aag gtt ggt tct ctt atc ggt aag agg atc ctt tct gag ctt tgg      239
Lys Lys Val Gly Ser Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Trp
          65             70             75

ggg ctt atc ttc cct tct ggt tct act aac ctt atg caa gat att ctt      287
Gly Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu
          80             85             90             95

agg gag act gaa caa ttc ctt aac cag agg ctt aac act gat act ctt      335
Arg Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu
          100             105             110

gct agg gtt aac gct gag ctt gag ggt ctt caa gct aac att agg gaa      383
Ala Arg Val Asn Ala Glu Leu Glu Gly Leu Gln Ala Asn Ile Arg Glu
          115             120             125

ttc aac cag caa gtt gat aac ttc ctt aac cct act caa aac cct gtt      431
Phe Asn Gln Gln Val Asp Asn Phe Leu Asn Pro Thr Gln Asn Pro Val
          130             135             140

cct ctt tct att act tct tct gtt aac act atg caa caa ctt ttc ctt      479
Pro Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu
          145             150             155

aac agg ctt cct caa ttc agg gtt caa ggt tac caa ctt ctt ctt ctt      527
Asn Arg Leu Pro Gln Phe Arg Val Gln Gly Tyr Gln Leu Leu Leu Leu
          160             165             170             175

cct ctt ttc gct caa gct gct aac atg cac cta agc ttc att agg gat      575
Pro Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp
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tgc att aac act tac caa act gct ttc agg ggt ctt aac act agg ctt Cys Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu 225 230 235	719
cat gat atg ctt gag ttc agg act tac atg ttc ctt aac gtt ttc gag His Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu 240 245 250 255	767
tac gtt tct att tgg tct ctt ttc aag tac cag tct ctt ctt gtt tct Tyr Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser 260 265 270	815
tct ggt gct aac ctt tac gct tct ggt tct ggt cct caa caa act caa Ser Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln 275 280 285	863
tct ttc act tct caa gac tgg cct ttc ctt tac tct ctt ttc caa gtt Ser Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val 290 295 300	911
aac tct aac tac gtt ctt aac ggt ttc tct ggt gct agg ctt act caa Asn Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln 305 310 315	959
act ttc cct aac atc ggt ggt ctt cct ggt act act act act cat gct Thr Phe Pro Asn Ile Gly Gly Leu Pro Gly Thr Thr Thr Thr His Ala 320 325 330 335	1007
ctt ctt gct gct agg gtt aac tac tct ggt ggt gtt tct tct ggt gat Leu Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp 340 345 350	1055
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gtt gtt agg aac gag gat ctt agg agg cct ctt cat tac aac gag att	1343

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agg aac att gag tct cct tct ggt act cct ggt ggt ctt agg gct tac	1391
Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr	
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atg gtt tct gtt cat aac agg aag aac aac atc tac gct gtt cat gag	1439
Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu	
465 470 475	
aac ggt act atg att cat ctt gct cct gag gat tac acc ggt ttc acc	1487
Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr	
480 485 490 495	
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Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe	
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atc tcc gag aag ttc ggc aac cag ggc gac tcc ctg agg ttc gag cag	1583
Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln	
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tcc aac acc acc gcc agg tac acc ctg agg ggc aac ggc aac tcc tac	1631
Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr	
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aac ctg tac ctc agg gtg tcc tcc ctc ggc aac tcc acc atc agg gtc	1679
Asn Leu Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val	
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acc atc aac ggc agg gtg tac acc gcc tcc aac gtg aac acc acc acc	1727
Thr Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr	
560 565 570 575	
aac aac gac ggc gtc aac gac aac ggc gct agg ttc ctg gac atc aac	1775
Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Leu Asp Ile Asn	
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Met Gly Asn Val Val Ala Ser Asp Asn Thr Asn Val Pro Leu Asp Ile	
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Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met	
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Asp Thr Ile Arg Lys Glu Trp Met Glu Trp Lys Arg Thr Asp His Ser
35 40 45

Leu Tyr Val Ala Pro Ile Val Gly Thr Val Ser Ser Phe Leu Leu Lys
50 55 60

Lys Val Gly Ser Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly
65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
100 105 110

Arg Val Asn Ala Glu Leu Glu Gly Leu Gln Ala Asn Ile Arg Glu Phe
115 120 125

Asn Gln Gln Val Asp Asn Phe Leu Asn Pro Thr Gln Asn Pro Val Pro
130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
145 150 155 160

Arg Leu Pro Gln Phe Arg Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro
165 170 175

Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
180 185 190

Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
195 200 205

Tyr Gln Asn Tyr Leu Lys Asn Tyr Thr Thr Glu Tyr Ser Asn Tyr Cys
210 215 220

Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
225 230 235 240

Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro
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Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg
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Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu Ser
 385 390 395 400

Thr Leu Gly Leu Arg Cys Gly Ala Phe Thr Ala Arg Gly Asn Ser Asn
 405 410 415

Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val
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Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile Arg
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Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr Met
 450 455 460

Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn
 465 470 475 480

Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile
 485 490 495